MICRF505/MICRF506/ MICRF6x0

User Manual for RF TestBench

sw v8.1

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1. Introduction

This document, “MICRF505/MICRF506/MICRF6x0 User Manual for RF TestBench” describes how to set up and use RF TestBench. For details on the MICRF505/MICRF506 transceiver or the MICRF505/MICRF506/MICRF6x0 development system: Please refer to the appropriate data sheet. For the latest updates, visit www.micrel.com.

RF TestBench v8.1 can be used with the following development systems:

MICRF505
MICRF506
MICRF600
MICRF610
MICRF620

The RF TestBench should be self-explaining. Use this document as a reference; it is not necessary to read it through before starting to use RF TestBench. Note, however, that some features require a special FW version (firmware = micro controller program). You can use the “Get FW version” command to get the present FW version of your board (refer to text below). If you do not have the latest (or wanted) version, please go to www.micrel.com for a free download.

Also note: Any calculated value in this program should be considered a suggestion. When transferred to a specific application, always test the RF performance. From v8.1, the program also suggests component values (like loop filter and antenna matching components). Note that these values are suggestions only; always test in your own application.

Important: New features are continuously added to RF TestBench. If a feature requires a special FW version (micro controller program): That FW version is explicit mentioned.

Outline of this document:
Following this introduction, an Installation chapter is given. Then the different menu items and dialog boxes are described. Observe that “MICRF6x0” in this document is a short-term for “MICRF600/MICRF610/MICRF620”. Finally, the updates in this sw version are listed. Note: Screenshots of several, but not all, windows are included.

Purpose of the RF TestBench:
RF TestBench can be used with or without a “development board”.

Users of MICRF505/MICRF506 radio transceiver can use the RF TestBench to calculate fields in the control word to enter into the RF chip.

Typical examples are:

- Get the complete 22-byte long control word to enter into the RF chip
- Get the “M”, “A”, “N” dividers for a specific frequency or a set of frequencies
- Get the “Mod_A” “Mod_I”, “Mod_clkS” and “RefClk_K” values for a specific deviation
- Get the resulting deviation, bit rate etc for a specific set of parameters
- Get component values to use with the MICRF505/MICRF506 (note: no components for the RF modules 600, 610, 620)
- Get external component values for a specific loop filter

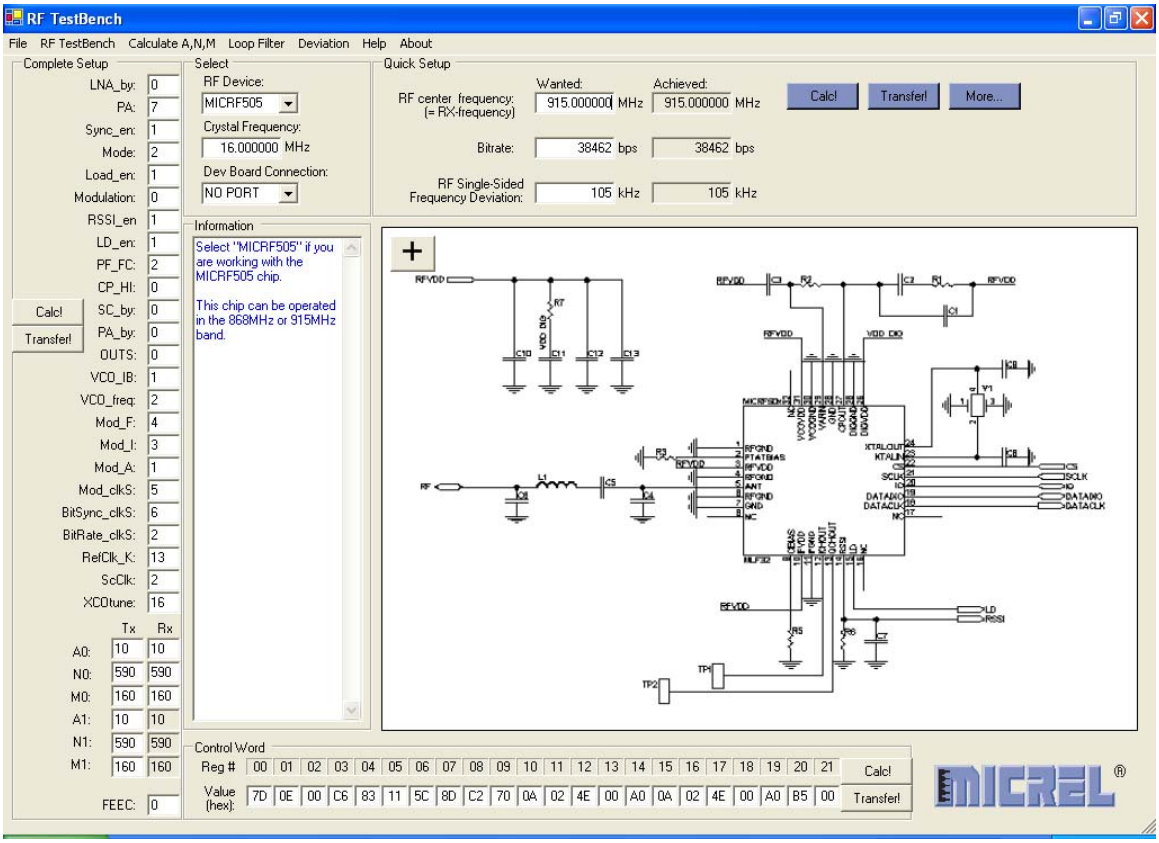
Main features:

The main window is split into several areas. There is a “Quick Setup” part (recommended as a starting point!), a “Complete setup”, and a “Control Word” part. In addition, there is a “Select” part and an “Information” part, as well as a schematics window.

And finally, there is a menu.

The reader is encouraged to locate these parts in the picture below.

Typically, when pressing any “Calc!” or “Transfer!” button, all the other fields are updated. In addition, the “Information field” is updated.



- **Quick Setup.** Enter parameters like wanted bit rate and RF frequency. Then see what the fields in the control word should be. Transfer control word to development board (where it is stored in EEPROM). The user is encouraged to start here!

- **Complete Setup.** Enter "fields" in the control word. Then see the resulting bit rate, deviation etc. Transfer control word to development board (where it is stored in EEPROM)

- **Control Word.** Enter complete register values (which typically covers several "fields" of the control word). Then see the resulting bit rate, deviation etc. Transfer control word to development board (where it is stored in EEPROM)

- **Commands to development board.** The set of commands to the board includes start to transmit 1010…, get firmware version, restart micro controller, reset EEPROM and read EEPROM

- **Bit Error Rate (BER):** Apply a 1010… pattern from an external source, and read out the number of bits read, the number of bits in error and the resulting bit-error-rate (a 1010… bit pattern, not a random bit pattern is applied. However, this test still gives an indication of the bit-error level). (***This feature requires FW v4 or later)***

- **Frequency Error Estimator (FEE):** Read out the FEE for different XCO-tune values, or find the best XCO tune value automatically ***(this feature requires FW v2 or later)***

- **Calculate the A, N, M frequency dividers.** Find 1 or several frequencies or set of frequencies

- **Loop filter.** Find values of external components for the loop filter

- **Deviation help.** Get suggestions for minimum deviation and filter settings, based on RF frequency, xtal tolerance etc

2. Install RF TestBench

The installation of RF TestBench is straightforward:

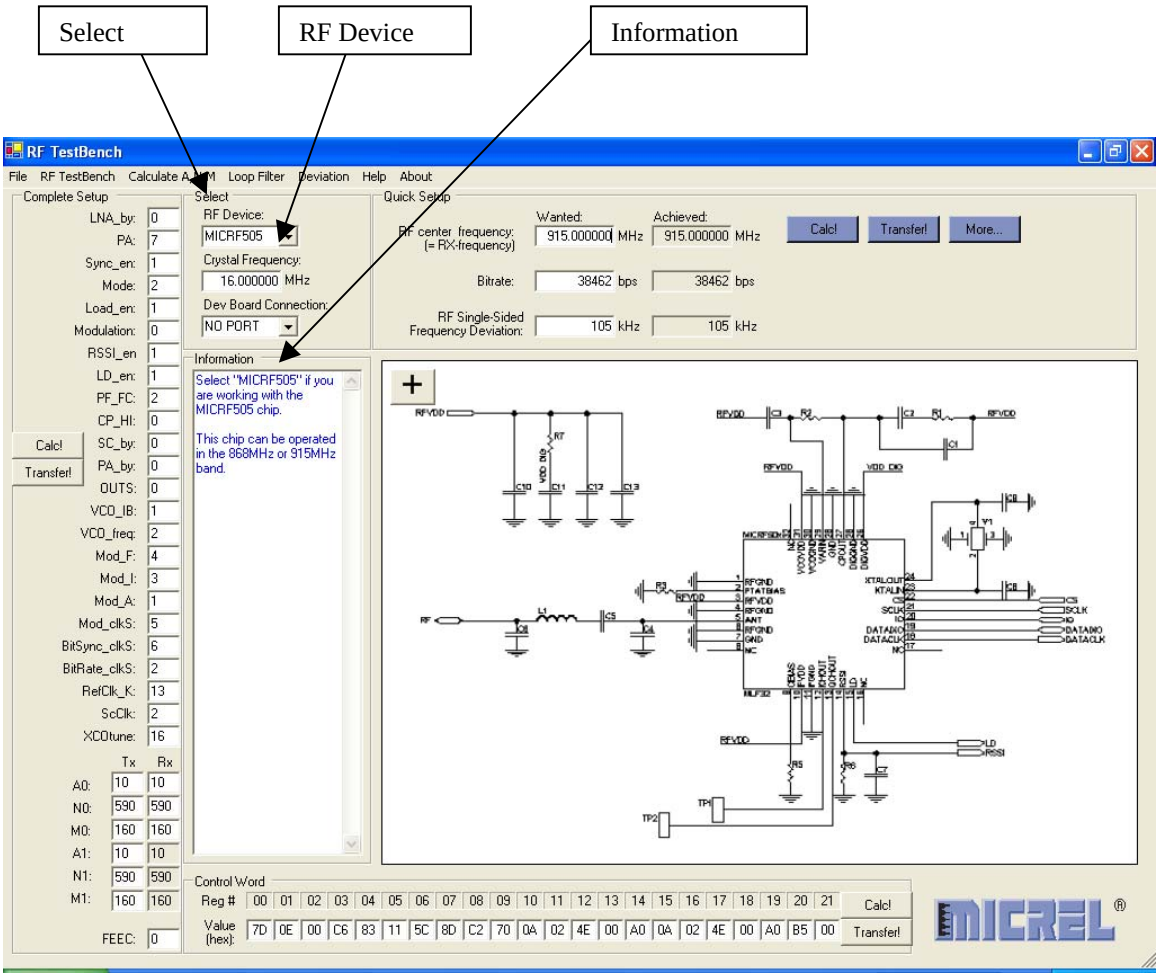
- Double-click “Setup.exe” and follow the on-screen instructions.
- Note: This program requires “.NET Framework” (Microsoft) to be installed. If this is not installed on your computer, you will get a message when you start the installation: You will be asked if you want to download and install the program “dotnetfx.exe ”. Please do.

To start RF TestBench:

- Click the Start button on the Windows taskbar, click Programs, and then click RF TestBench.
- When the program starts, a welcome-message is displayed. Please read it, and then press the OK button. Then the main window will be displayed.

First step:

- As an initial step, make sure to select the correct RF device in the “Select” part of the main window, refer to figure below. Observe the text in the “Information” part, which is changed when a new part is selected (if you “select” the already selected part, all parameters will be reset to default).
- Then use the “Quick Setup” features as a starting point (observe the blue push-buttons in this area)


Select
RF Device
Information
RF TestBench
File RF TestBench Calculate ALFM Loop Filter Deviation Help About
Complete Setup
LNA_by: 0
PA: 7
Sync_en: 1
Mode: 2
Load_en: 1
Modulation: 0
RSSI_en 1
LD_en: 1
PF_FC: 2
CP_HI: 0
SC_by: 0
PA_by: 0
OUTS: 0
VCO_IB: 1
VCO_freq: 2
Mod_F: 4
Mod_I: 3
Mod_A: 1
Mod_clkS: 5
BitSync_clkS: 6
BitRate_clkS: 2
RefClk_K: 13
ScClk: 2
XCOtune: 16
Tx Rx
A0: 10 10
N0: 590 590
M0: 160 160
A1: 10 10
N1: 590 590
M1: 160 160
FEEC: 0
Calc!
Transfer!
Select
RF Device:
MICRF505
Crystal Frequency:
16.000000 MHz
Dev Board Connection:
NO PORT
Information
Select "MICRF505" if you are working with the MICRF505 chip.
This chip can be operated in the 868MHz or 915MHz band.
Quick Setup
Wanted: Achieved:
RF center frequency: (= RX-frequency) 915.000000 MHz 915.000000 MHz
Bitrate: 38462 bps 38462 bps
RF Single-Sided Frequency Deviation: 105 kHz 105 kHz
Calc!
Transfer!
More...
Control Word
Reg # 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21
Value (hex): 7D 0E 00 C6 83 11 5C 8D C2 70 0A 02 4E 00 A0 0A 02 4E 00 A0 B5 00
Calc!
Transfer!
MICREL

3. Main window

The “Main Window” is the window that pops up after you have read the welcome message and pressed the OK button in the Welcome window.

Starting from v.8.1, the Main Window is completely re-organised. Here you will find:

- “Select”
- “Information”
- “Quick Setup”
- “Complete Setup”
- “Control Word”
- “Schematics”.

These items are described in detail below.

In addition to these features, the Main Window holds a menu. The menu items of RF TestBench are described in the next section.

3.1. Select

In the “Select” area, you select

- RF Device
- Crystal Frequency
- Dev Board Connection

Refer to the text below.

RF Device

This is where the MICRF505 or MICRF506 chip, or a MICRF6x0 RF module, is selected. If you are using a development board (“dev board”): Always select the part mounted on the dev board. You don’t have to use a dev board; you can use this program as a stand-alone program, without connecting your computer to a development board.

Note that the selected RF part determines the default settings. For example, if “MICRF505” is selected, then the default bit rate is set to 38462bps. If “MICRF600” is selected, then the default bit rate is 19231 bps. For a complete list of default settings, simply select a RF part and look at the settings (in “Quick Setup” and “Complete Setup”).

All settings are reset to default if a new RF part is selected, or if the already selected part is selected again. Example: You have selected “MICRF505” initially. Then, after you have made several changes, you might want to reset the settings to their default state. You can do this by selecting “MICRF505” again.

Whenever you select a RF device, the “Information” window is updated. The schematic is updated as well – observe: If you select a MICRF6x0 RF module, then there are no external components, and a simple application drawing is shown.

If you have selected “MICRF505” or “MICRF506”, then you can click in the schematics to get suggested component values in the “Information” area.

The presently selected RF part is always shown in the “Select” area.

Firmware requirements (dev board micro controller program):

- MICRF505: all fw versions
- MICRF506: ***this feature requires FW v2 or later***
- MICRF600: ***this feature requires FW v3 or later***
- MICRF610***: this feature requires FW v4 or later***
- MICRF620***: this feature requires FW v4 or later***

Crystal Frequency

This is where you select the xtal to use with the RF part (observe that the MICRF6x0 RF modules have an on-board xtal).

In many applications, a micro controller (MCU) is used to control the RF part. The MCU may have it’s own xtal. Note that the xtal you select in the RF TestBench program, is the one connected to the RF part.

Dev Board Connection

This is where you select the connection to the dev board (and connects to the dev board). If you are not using a dev board, then select “NO PORT”. Else, select COMi, where i = 1, 2, 3, or 4.

Note: By selecting “NO PORT”, you close the presently selected port, that is: The port can be used by another program you want to run at the same time.

If the port can’t be opened, you will get a message.

Before connecting to a dev board, make sure all cables are in place, and that the correct DIP settings are made on the dev board (refer to Dev board user manual).

3.2. Information

In the “Information” area, the program prints information about:

- The presently selected RF device (when a RF part is selected) and
- The “fields” in the control word (when you point to the name of a “field” in “Complete Setup”) and
- All “fields” in a register (when you point to the register address in “Control Word”) and
- Suggested component values for MICRF505/MICRF506 (when you click at the schematics) and
- (Maybe most important!) Calculated/resulting frequencies, bitrates etc when a “Calc!” or “Transfer!” button is pressed.

The user is encouraged to explore all these features, and to use them frequently!

Note that the “old information” is over-written when “new information” is shown.

You can print out the contents of the “Information” field whenever you want. From the menu in the main window, select → File → Print Information …

3.3. Quick Setup

This is the suggested starting-point (after you have selected a RF part). Simply make your inputs (“Wanted” input fields) and press the blue “Calc!” button.

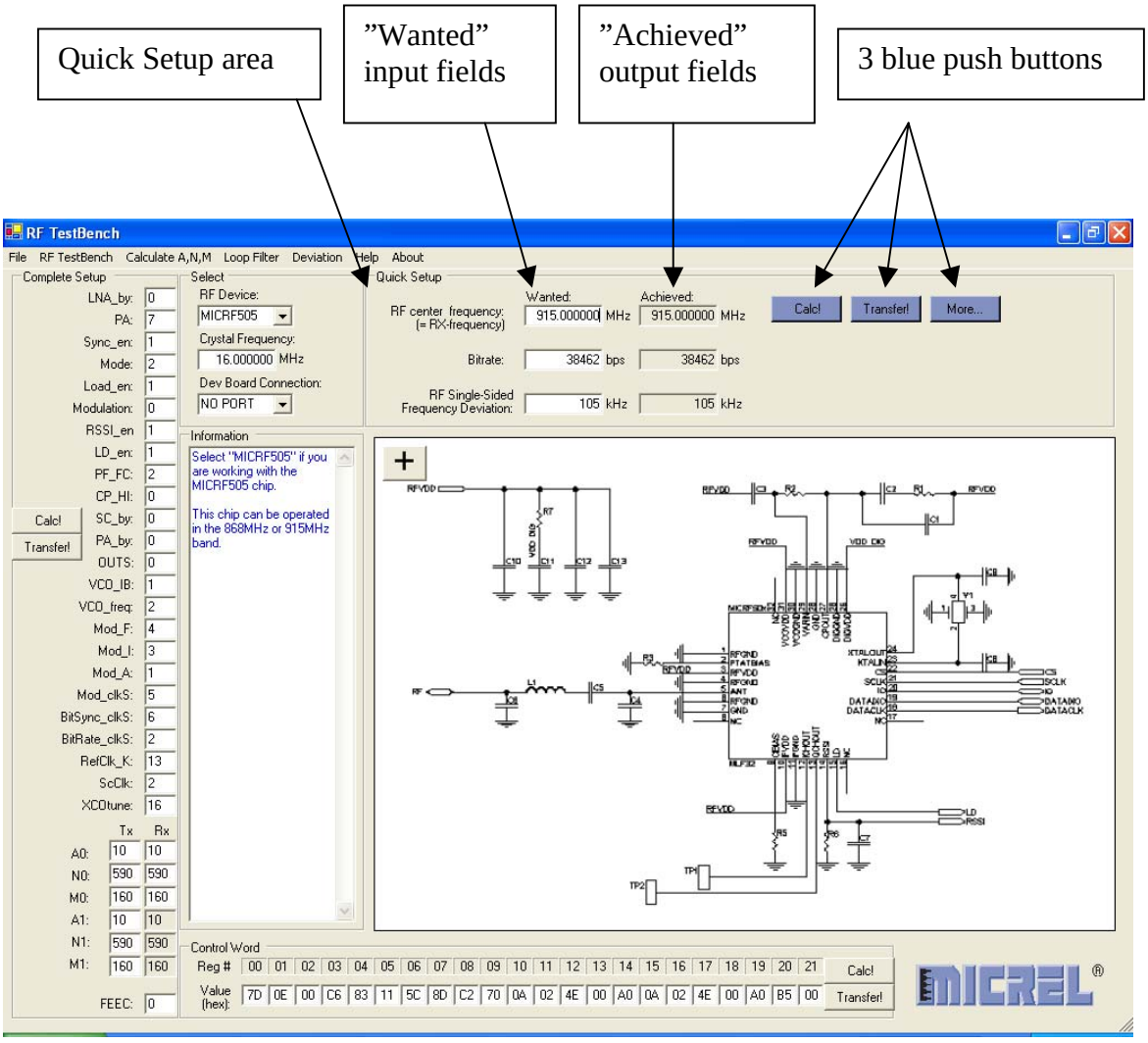
Observe the 3 blue buttons (described in detail below):

- “Calc!”
- “Transfer!”
- “More!”

Observe the 3 input-fields below “Wanted” (described in detail below):

- RF centre frequency (= RX- frequency)
- Bitrate
- RF Single-Sided Frequency Deviation

Observe the 3 read-only fields below “Achieved”, which corresponds to the “Wanted” fields.



Input fields:

- Wanted RF centre frequency
  - Enter the RF centre frequency (in MHz). This will be the frequency used in receive mode.
- Wanted Bitrate
  - Enter the wanted "on-the-air" bit rate. This is also referred to as "number of "signal elements/second". Note: Based on the "Wanted Bitrate", the program will set the type of modulation.
- Wanted Single-Sided Frequency Deviation
  - Enter the single-sided deviation (in kHz). The frequency for transmitting a "0" will be the "Wanted RF Frequency" – "Wanted Deviation", and the frequency for transmitting a "1" will be "Wanted RF Frequency" + "Wanted Deviation"

Calc! and Transfer! Buttons:

When "Calc"! or "Transfer" is pressed, then the wanted settings are used to construct the control word. In addition, several other fields will be used in the calculations (for a first-time use, keep these unchanged):

- The selected "RF Device" determines the default settings and the formulas for constructing the RF frequencies. Make sure the correct RF part is selected.
- The selected "Crystal Frequency". This is used in the formulas
- The fields in the control word that are not calc'ed in "Quick Setup", are collected from "Complete Setup". Examples: LNA_by, PA, Sync_en, Mode, Load_en.
- From the main menu, some "advanced" settings can be made. Select → RF TestBench → Advanced Quick Setup … For example, you can change the tolerances used when calculating the frequencies (the target will always be the "Wanted Settings" when the blue Calc! button is pressed.)

If you are using a development board, then you can use the "Transfer!" button to transfer the resulting control word to the development board.

After you have pressed "Calc"! or "Transfer!" in "Quick Setup", then all fields will be updated:

- The "Achieved" fields in "Quick Setup" will show the results
- In "Complete Setup" all field values are updated. The fields that changed value are shown in red.
- In "Control Word" all register values are updated. The registers that changed value are shown in red.
- In "Information", you will get the resulting frequencies etc.

More… button:

If you press the "More… " button, then 2 additional settings are displayed. These are:

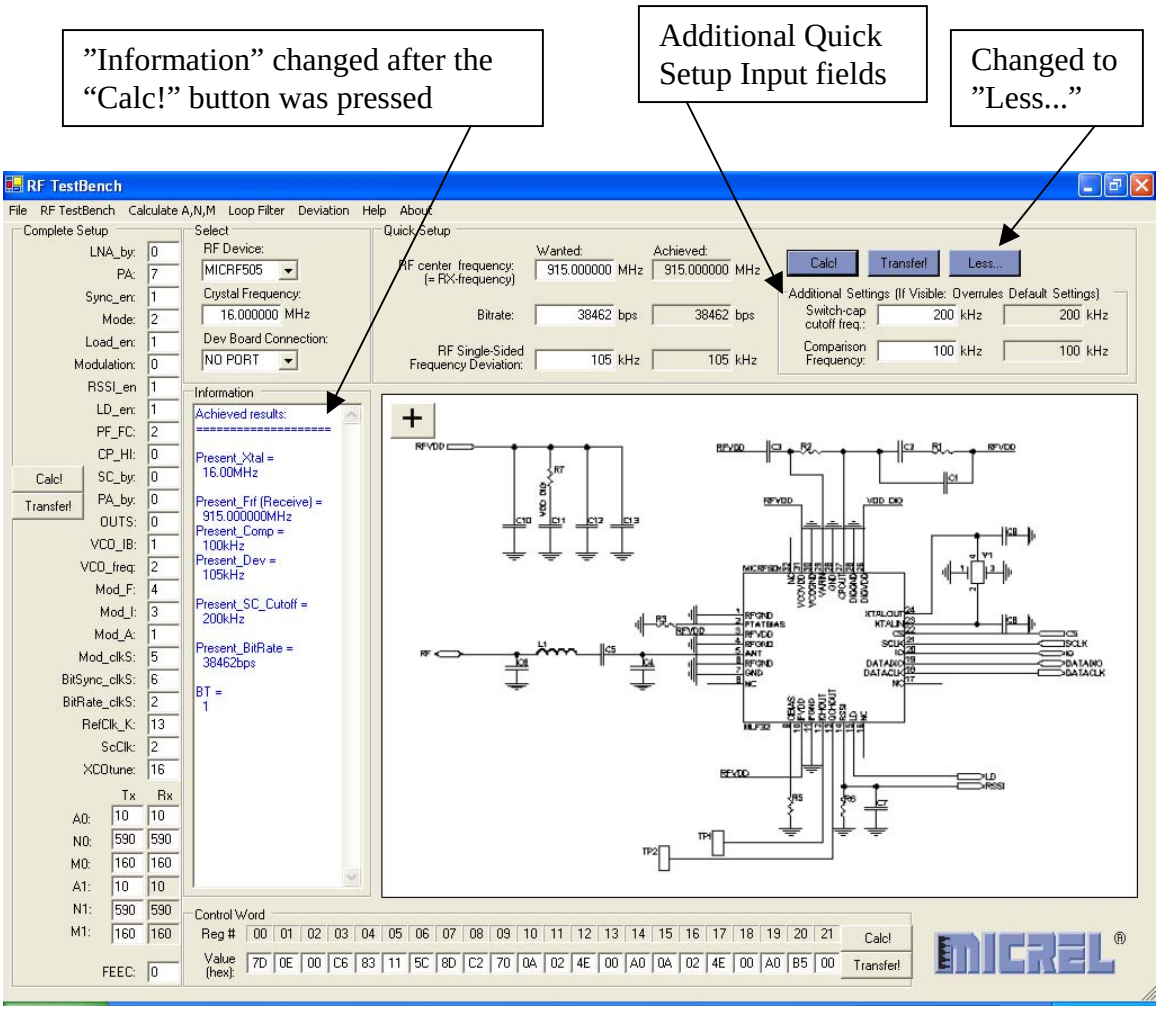
- Wanted Comparison frequency
  - Enter the wanted comparison frequency (in kHz) here
- Wanted Switch-cap cut off frequency
  - Enter the wanted cut-off frequency for the switch-cap filter here

At the same time, the button is changed to "Less… ". Press it to hide the additional settings.

If the additional settings are visible, then these settings are used in the calculations. If not visible, then the default settings are used.

It is recommended to use the default settings the first-time you use this program.

To get the figure below, the "More…" button was pressed, then the "Calc!" button was pressed. Observe the additional fields, the name of the blue button (changed to "Less…") and the "Information" field.



Tolerance:

When calculating the control word, it may be that the "Wanted" values are not completely found. The tolerances used in the calculations are adjustable, select → RF TestBench → Advanced Quick Setup … . Do not change these values until you are familiar with RF TestBench and the RF part.

Hint 1: Use the "Complete Setup" window to fine-tune the parameters.
Hint 2: If you can accept a higher tolerance than the program uses, try to change the "Wanted" parameters and calculate again.
Hint 3: Consider using another xtal frequency if the achieved results are not close enough to your "Wanted" values.

Output Fields:

Always consider any output from RF TestBench a suggestion only!

- Achieved RF Frequency
  - This will be the achieved frequency used in receive mode
- Achieved Bit rate
  - Achieved on-the-air bit rate
- Achieved Deviation (In "Quick Setup", the program determines the modulation type based on the bitrate):
  - If VCO modulation is selected (bitrate >20kbps): "Achieved Deviation" is the achieved single-sided deviation
  - If Internal modulation (switching between two sets of A, N, M dividers) is selected (bitrate <=20kbps): "Achieved Deviation" is the middle of the tx0 and tx1 frequency deviation

If the additional fields are visible:

- Achieved Comparison Frequency (In "Quick Setup", the program determines the modulation type based on the bitrate):
  - If VCO modulation is selected (bitrate >20kbps): "Achieved Comparison Frequency" is the achieved comp frequency
  - If Internal modulation (switching between two sets of A, N, M dividers) is selected (bitrate <=20kbps): "Achieved Comparison Frequency" is the in-the-middle value of comp freq for rx, tx0 and tx1
- Achieved SC Cutoff
  - Achieved switch capacitor filter cut off frequency

Store and restore values

It is possible to store and restore the present value of the control word. Use → File → Open… or → File → Save As… from the menu in the main window.

The file will be stored as a .txt file.

Hint: Storing (Save As …) the present control word is a handy way to export the control word to e.g another user of RF TestBench, or when requesting support. Then the "other User" can restore (Open …) the file to get the same values into RF TestBench (assuming equal RF Device and Crystal Frequency).

Reset to Default values

Simply re-select the RF part, and the default values will be used (values equal to program start-up values).

3.4. Complete Setup

Here you can update fields in the control word and calculate the resulting frequencies etc. Note the difference from “Quick Setup”. Instead of trying to match the “Wanted Settings”, the program now calculates frequencies etc based on the field values.

By pointing to a field name, the “Information” area will be updated. You will get the following info:

- Register address and bit-position
- A more descriptive name
- The range of legal values for the field.

Example: By pointing to the “Mode” field name, you get the following information:

> Mode: (Reg0, Bit2-1)
> Mode of operation:
> 0: Power Down
> 1: Standby
> 2: Receive
> 3: Transmit

When pressing the “Calc!” or “Transfer!” button in the “Complete Setup” area, the control word will be calc’ed, and all fields (“Quick Setup”, “Control Word” and “Information”) are updated.

Note the “Tx-set” and the “Rx-set” of frequency dividers: If “transmit mode” is selected, then use the Tx-set and v.v for receive-mode. In practice, this will be different for “A, N, M modulation” only. In this case, you will get/set all 3 sets of A, N, M dividers: The tx0 and tx1 sets as well as the rx set. Also observe that the “A1, N1, M1 set” for rx is not editable. In receive-mode, the “A0, N0, M0 -set” only is used.

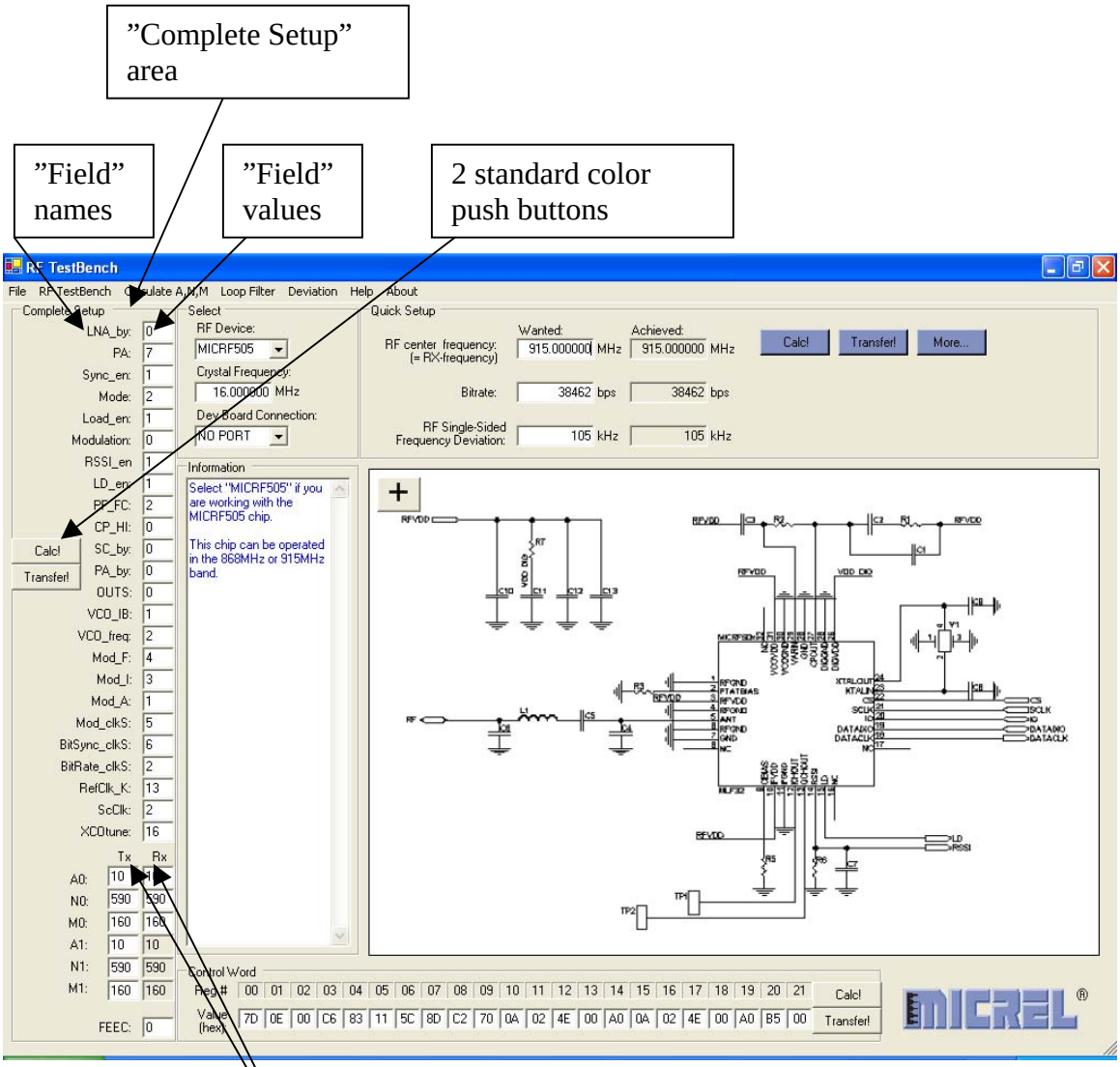
Always make sure that all frequency dividers are > 0 (“A”-dividers can be 0, but for simplicity: It is suggested to keep all dividers > 0). Setting an N –divider and/or an M -divider equal to 0 will result in chip lock.

Like the “Quick Setup” feature, you can

- Store/Restore control word values
- Print “Information” field
- Reset to default
- Transfer to development board

Refer to “Quick Setup” for a description of these features.

If a field value is changed (after pressing any “Calc!” or “Transfer!” button), then the value will be displayed in red.


”Complete Setup” area
”Field” names
”Field” values
2 standard color push buttons
RF TestBench
File RF TestBench Calculate A,M,M Loop Filter Deviation Help About
Complete Setup
Select
Quick Setup
RF Device:
MICRF505
Crystal Frequency:
16.000000 MHz
Dev.Board Connection:
NO PORT
RF center frequency: (= RX-frequency)
Wanted:
Achieved:
915.000000 MHz
Bitrate:
38462 bps
RF Single-Sided Frequency Deviation:
105 kHz
Calc!
Transfer!
More...
Information
Select "MICRF505" if you are working with the MICRF505 chip.
This chip can be operated in the 868MHz or 915MHz band.
LNA_by:
PA:
Sync_en:
Mode:
Load_en:
Modulation:
RSSI_en
LD_en:
PF_FC:
CP_HI:
SC_by:
PA_by:
OUTS:
VCO_IB:
VCO_freq:
Mod_F:
Mod_I:
Mod_A:
Mod_clkS:
BitSync_clkS:
BitRate_clkS:
RefClk_K:
ScClk:
XCOtune:
Tx
Rx
A0:
N0:
M0:
A1:
N1:
M1:
FEEC:
Control Word
Reg.#
Value (hex)
Frequency dividers for “Transmit” and “Receive” mode

3.5. Control Word

Here you can update complete registers in the control word and calculate the resulting frequencies etc. Note the difference from “Complete Setup”: In “Control Word” you typically change several fields in one operation.

It is possible to change all bits, including “fixed” bits, by entering the address and value directly. However, unused bits are not editable. Example: To set the value in register 0x0A equal to 0x1F: Enter “0A” in the address field; enter “1F” in the value-field. Then press the “Calc!” button (the one in the “Control Word” area of the main window).

By pointing to a register address (“Reg #”), the “Information” area will be updated. You will get the following info:

- General info about “fixed” fields (this information is common for all registers, even if the selected register does not have any fixed bits)
- Bit-by-bit info for the selected register.

Example: By pointing to register address “00”, you get the following information:

> Note: "Fixed" fields are also included. The "fixed" fields are not described in the data sheet or in this program. Always maintain these bits to their "fixed" value.
>
> Reg0:
> Bit7: By_LNA
> Bit6: PA2
> Bit5: PA1
> Bit4: PA0
> Bit3: Sync_en
> Bit2: Mode1
> Bit1: Mode0
> Bit0: Load_en

When pressing the “Calc!” or “Transfer!” button in the “Control Word” area, the control word will be calc’ed, and all fields (“Quick Setup”, “Complete Setup” and “Information”) are updated.

Always make sure that all frequency dividers are > 0 (“A”-dividers can be 0, but for simplicity: It is suggested to keep all dividers > 0). Setting an N –divider and/or an M -divider equal to 0 will result in chip lock.

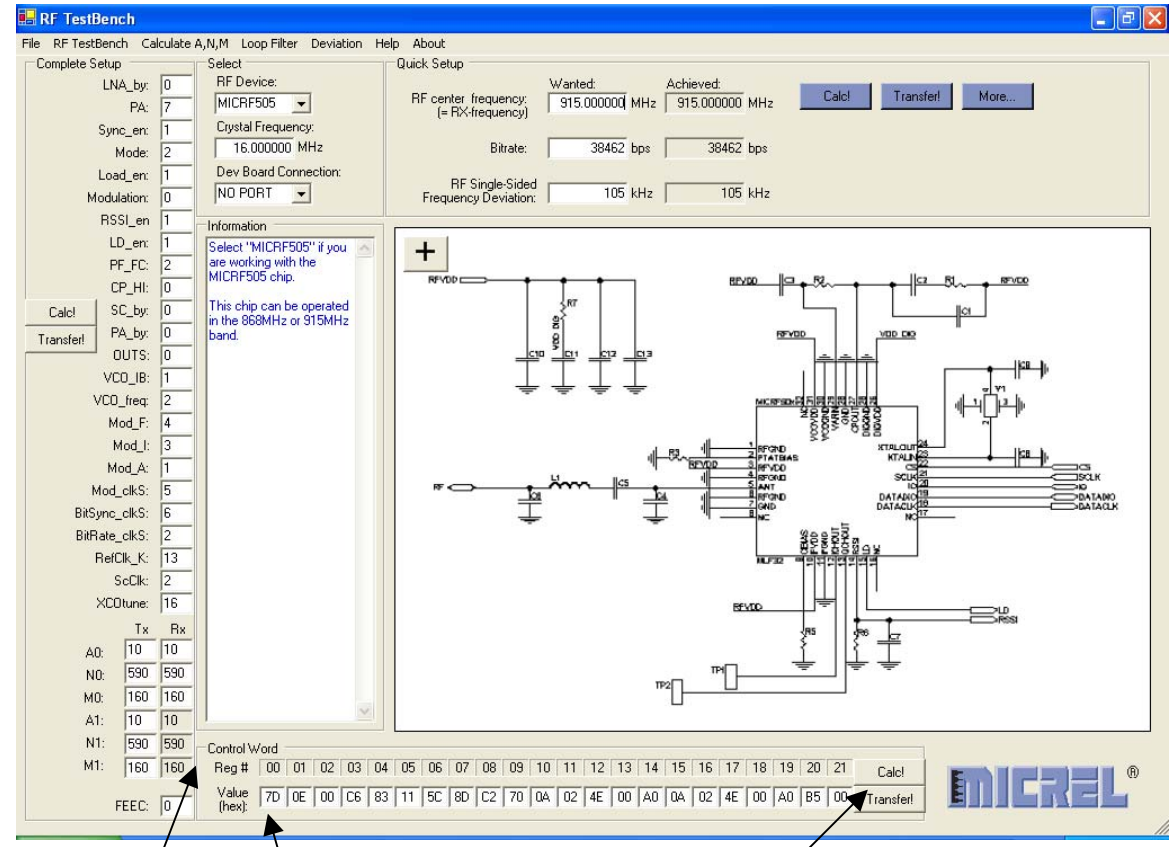
Like the “Quick Setup” and “Complete Setup” features, you can

- Store/Restore control word values
- Print “Information” field
- Reset to default
- Transfer to development board

Refer to “Quick Setup” for a description of these features.

If a register value is changed (after pressing any “Calc!” or “Transfer!” button), then the value will be displayed in red.

Note that the register value must be entered as a hexadecimal number.



2 standard color push buttons

Registervalue for Reg #0 (in hex format)

”Control Word” area

3.6. Schematics

In the “Schematics” area, you will get a typical application circuit.

If you have selected MICRF505/MICRF506:

- By pressing the “+” push button, you will maximize the schematics. This is achieved by double-clicking in the schematics area as well.

- From the maximized schematics, you can select to print the drawing. Observe the paper orientation (use “Landscape”).

- In the main window, by clicking in the schematics area, you will get a list of suggested component values in the “Information” area.

If you have selected MICRF6x0:

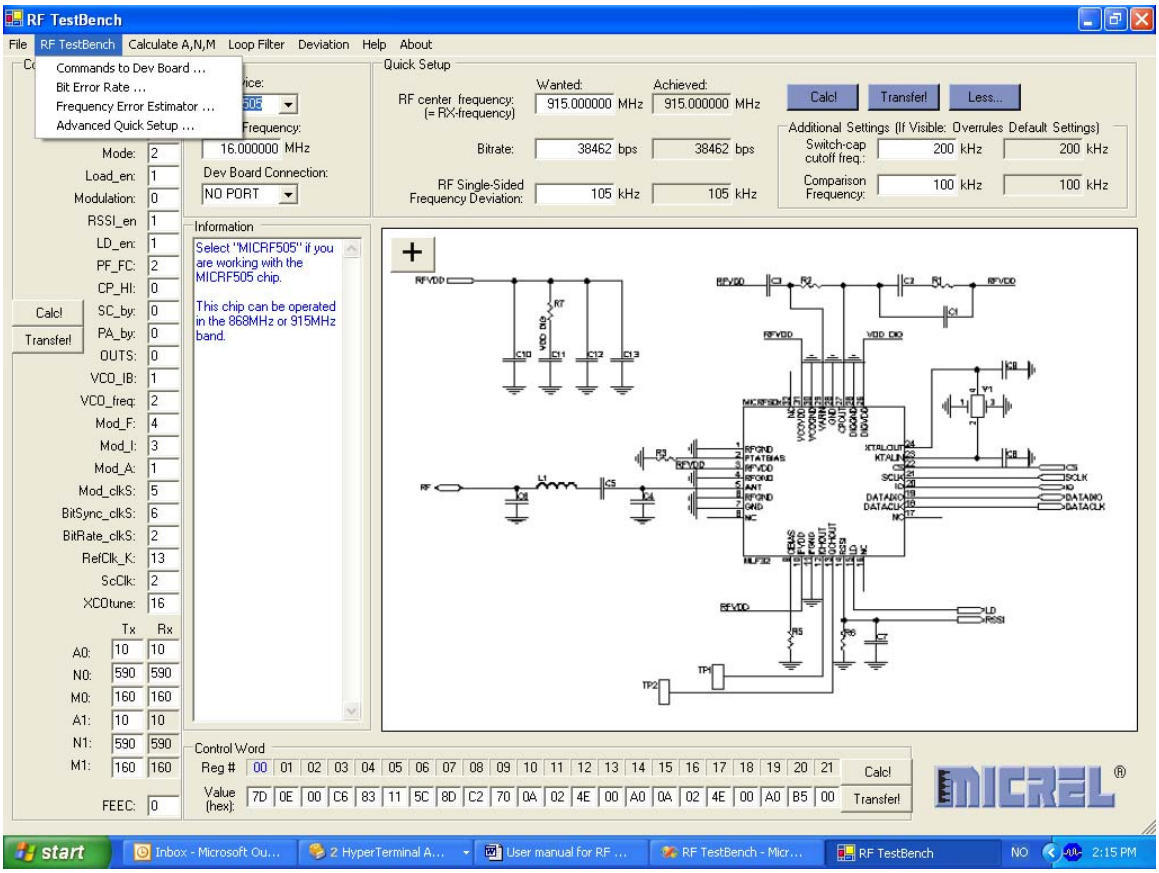
- The schematics will show a simple application drawing, without any component suggestions
- (All components are on-board)

4. Menu items and dialog boxes

In the following, the menu items and dialog boxes will be described. A menu item is always preceded with “→” in the text below.

4.1. →RF TestBench

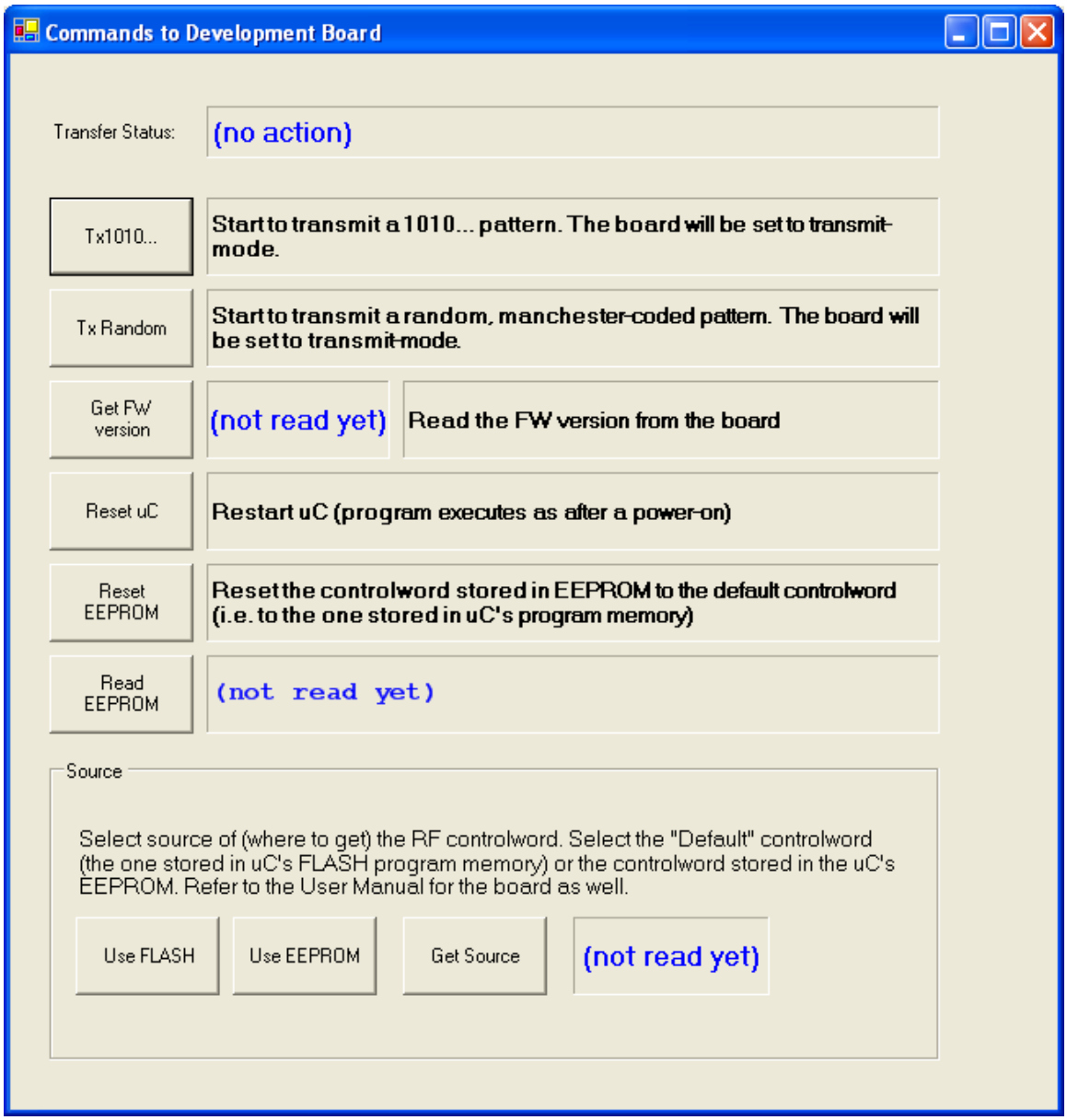
This is where you can give commands to the development board, or use some of the special features like bit-error rate calculator.



The menu items in “RF TestBench” are described below.

4.2. →RF TestBench → Commands to Dev Board …

The “Commands to Development Board” window pops up.



Push Buttons:

- TX1010
  - Start to transmit a 1010… pattern. Transmit-mode will be entered, over-ruling the entered control word. Modulation will stop if another command is given.
- TX Random ***(this feature requires FW v3 or later)***
  - Start to transmit a random, Manchester-coded pattern. Transmit-mode will be entered, over-ruling the entered control word. Modulation will stop if another command is given.

- Get FW v.
  - Get the firmware version of the program presently in the micro controller. New features may be added to new versions of the firmware. Make sure your firmware version supports the features you want to use in RF TestBench (if a feature requires a special FW version: It is described with the feature in this manual).
- Reset uC
  - Restart micro controller
- Reset EEP
  - Fill EEPROM with default settings of the control word
- Read EEP
  - Read the presently stored EEPROM control word.
- Use FLASH
  - Instruct the development board to use the control word stored in FLASH program memory of the micro controller. This is identical to the "Default" settings.
- Use EEP.
  - Instruct the development board to use the control word stored in EEPROM of the micro controller. The user-entered control word stored in EEPROM is used in RF test modes, 2-way link test mode and simple byte transfer mode.
- Get Source
  - Find out if the board will use the FLASH or the EEPROM memory (i.e. the "default" and the "user-entered" control words, respectively)

Output fields:

- FW version
  - Present firmware version (micro controller program). FW version 99 is used for test-programs.
- Control word read from EEPROM
  - Presently EEPROM-stored control word
- Source is
  - FLASH or EEPROM will be displayed
- Transfer Status
  - Messages related to the transfer of commands are displayed here. After pressing Transfer, "Waiting…" will be displayed. If no response from board, "Waiting…" will continue to be displayed. If response from board is received, "Success" or "Error" will be displayed. If Error: Please test communication cable, power, DIP switch setting and jumpers.

4.3. →RF TestBench →Bit Error Rate …

(This feature requires FW v.4 or later)

The “Bit Error Rate (1010… test)” window pops up.

This feature requires the use of a development board. NOTE: Not all development board firmware versions will support this feature.

Before starting, please make sure:

- Make sure the dev. Board is in receive mode. This can be done via the “Complete Setup … “ feature from the main window
- Make sure a transmitter is present, and transmitting 1010… at the correct frequency, with the correct deviation and so on. As a starting point, use another development board to transmit 1010…

Start:

- Press the “Start” button and observe the results. Note the time delay between pressing the “Start” button and the update of the fields.

Note:

- In the micro controller, the BER procedure will read bytes of the received RF input. If the byte is equal to 10101010 or 01010101, then it is OK, and 0 errors are detected. If any other byte-value is read, it will be counted as 1 error.

Stop:

- The BER procedure in the micro will stop if the “Stop” button is pressed, or if any other command is given to the development board.

4.4. →RF TestBench →Frequency Error Estimator …

(This feature requires FW v2 or later)

The “Frequency Error Estimator” window pops up. Please read all the text in this window.

This feature requires the use of a development board. NOTE: Not all development board firmware versions will support this feature.

Read the FEE value by pressing the “Read!” button, or by stepping XCO-tune value up/down.

Pressing the “Tune” button will start a process to get the best XCO tune value.

Press the “Keep” button to use the XCO tune value from this dialog in the “Quick” and “Complete” dialogs.

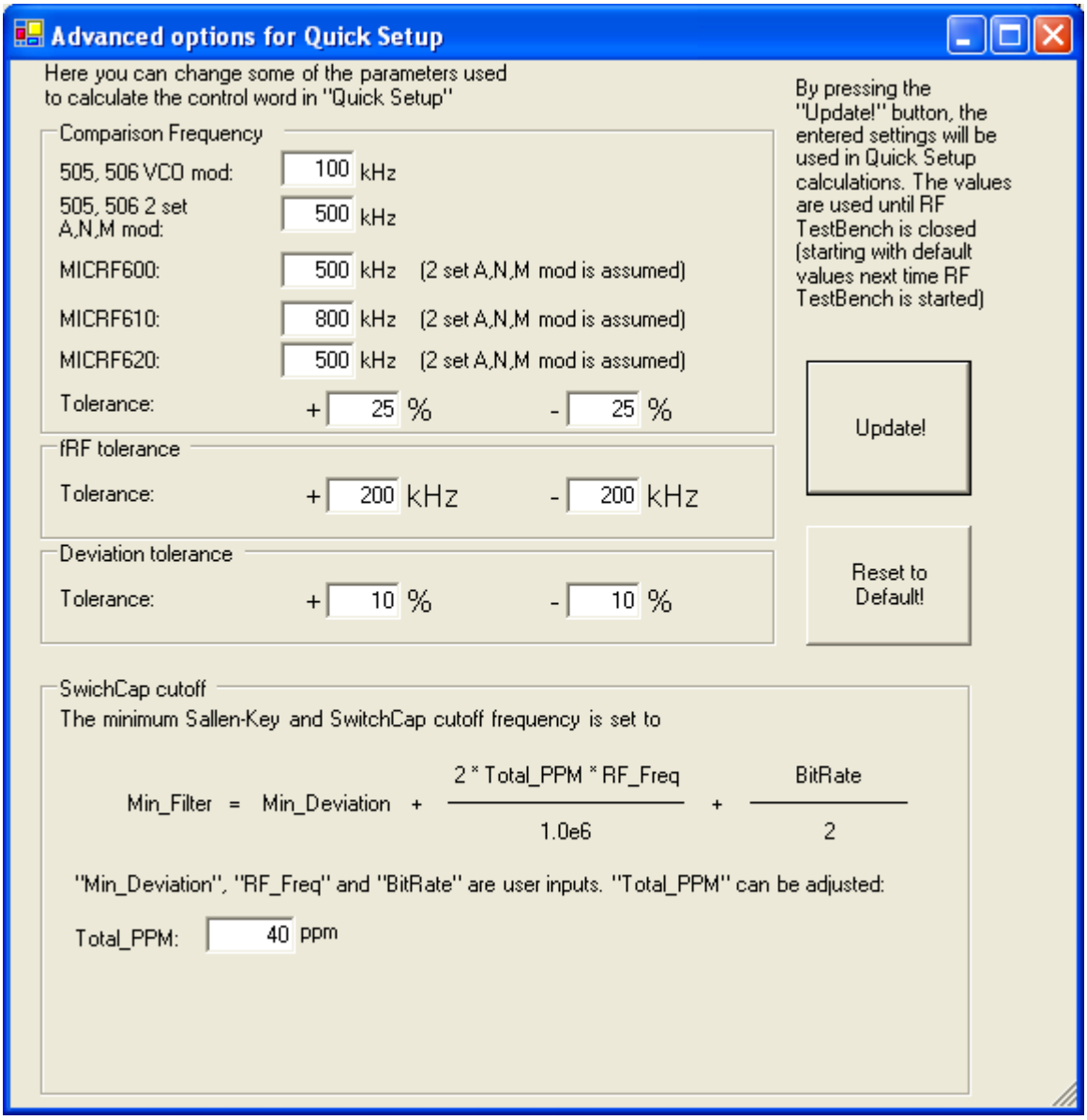
Please refer to the MICRF505/MICRF506 manual for details on the FEE.

Before using this feature:

- Please read the MICRF505/MICRF506 user manual
- Set the development board in rx, on the wanted frequency and bit rate (Use "Quick Setup" or "Complete Setup", press "Transfer")
- Apply a tx-signal (use another development board or a signal generator)

4.5. →RF TestBench →Advanced Quick Setup…

Here you can change the tolerances and several default values. Please read the text in the window. Note: The "Advanced Options" window may look different from the picture below.



4.6. →Calculate A, N, M …

This is an aid for determining frequency dividers. You can use the "Quick Setup" as well (to find 1 frequency / frequency set). Note that the tolerances in the Quick Setup dialog are fixed, while they are adjustable here. This may give slightly different results.

Experiment with tolerances etc to get the frequency set you want!

Frequencies are calculated based on the following priorities:

1. As close to the RF frequency as possible
2. As close to the comparison frequency as possible
3. If a RF frequency is not a 100% hit, it must improve the best RF frequency found with > 1kHz, or else the one with the highest comparison frequency is used.

Please make sure that the correct RF dewvice and crystal frequency are selected in the main window before using these calculators.

4.7. →Calculate A, N, M →Find 1…n frequencies, using modulator…

The "Calculate frequency dividers (A, N, M): Use modulator" window pops up.

1 or a number of frequencies can be calculated.

Fill in wanted frequencies etc and press the "Calc!" menu item. Then see the results.

It's possible to store the results in a .txt file: Use the →File → Save As … menu item from the menu in the calculator window (not the main window).

Note that new results over-write the old ones in the window.

4.8. →Calculate A, N, M →Find 1…n frequencies, using two sets of dividers…

The "Calculate frequency dividers (A, N, M): Use two sets of dividers" window pops up.

1 or a number of frequency sets can be calculated.

Fill in wanted frequencies etc and press the "Calc!" menu item. See the results.

It's possible to store the results in a .txt file: Use the →File → Save As … menu item from the menu in the calculator window (not the main window).

Note that new results over-write the old ones in the window.

4.9. →Loop Filter

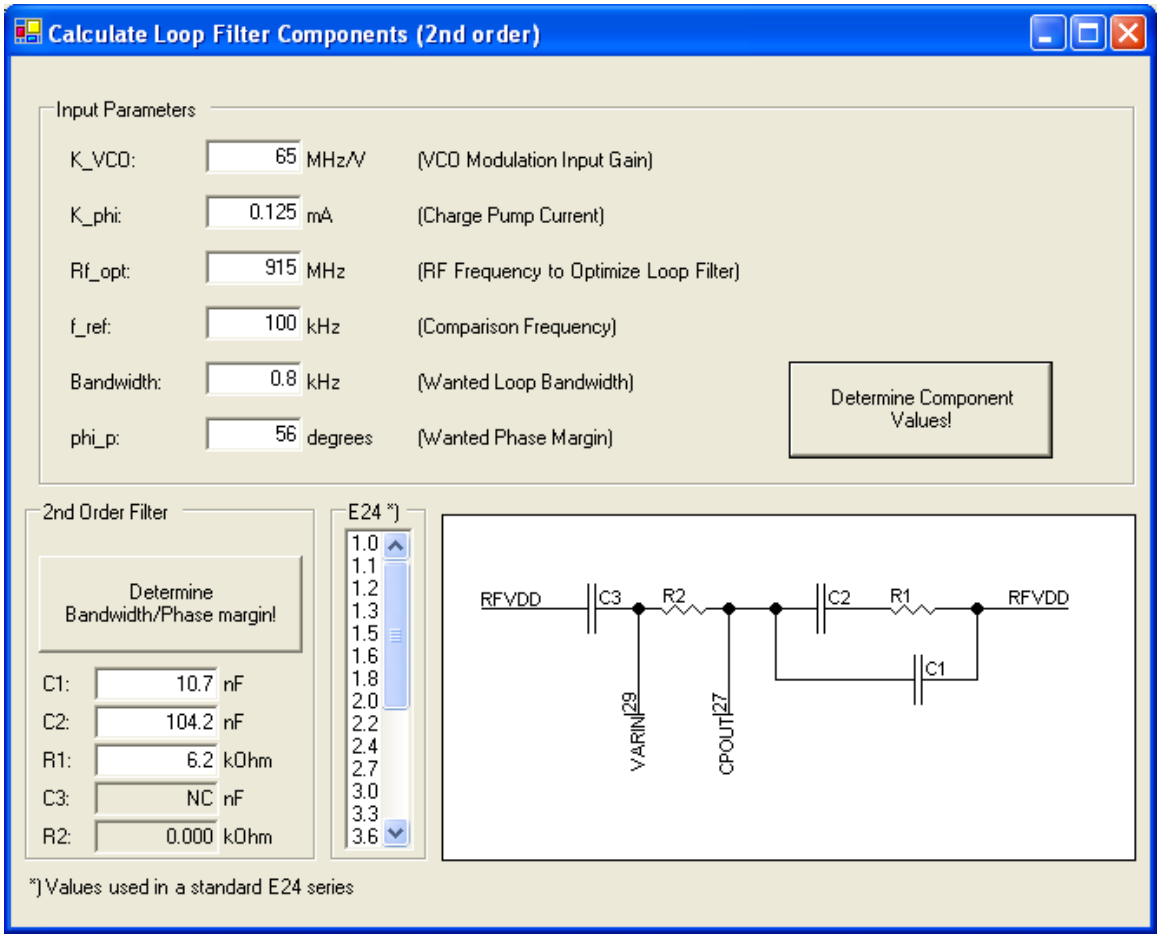
This can be used as an aid when determining component values of the external loop filter.

4.10. →Loop Filter →Find 2nd Order …

Enter parameters and calculate components, or
Enter component values and determine bandwidth and phase margin.

The standard E24 series is included to show available component values.

In addition, a drawing of the loop filter is shown.



4.11. →Loop Filter →Find 3rd Order …

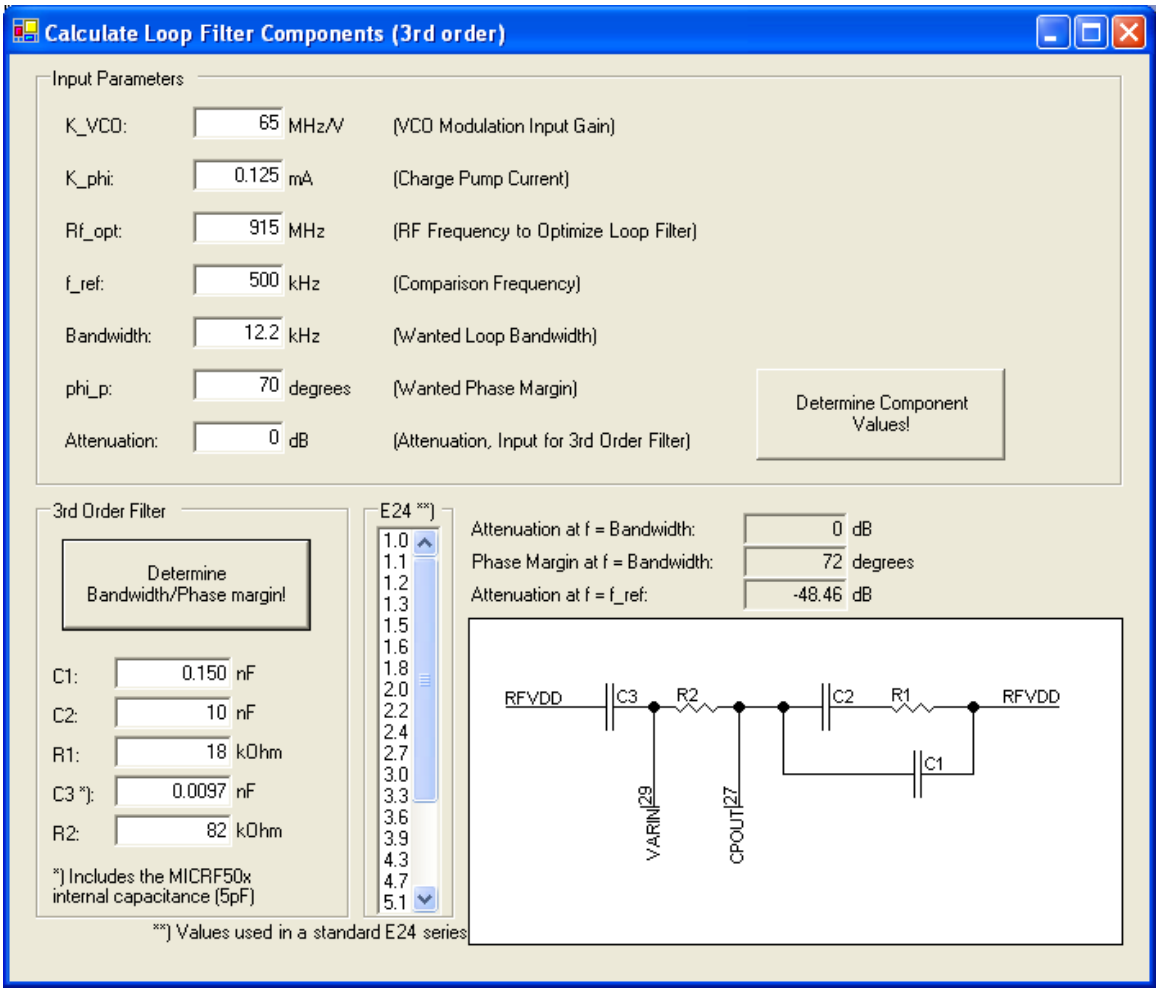
Enter parameters and calculate components, or
Enter component values and determine bandwidth and phase margin (set Attenuation = 0 if calc'ing Bandwidth and Phase Margin.)

The standard E24 series is included to show available component values.

In addition, a drawing of the loop filter is shown.

Note the achieved results with the given components.

In the figure below, loop filter components are entered, then the "Determine Bandwidth/Phase Margin!" button is pressed. In this case, the 3 read-only fields are not updated.



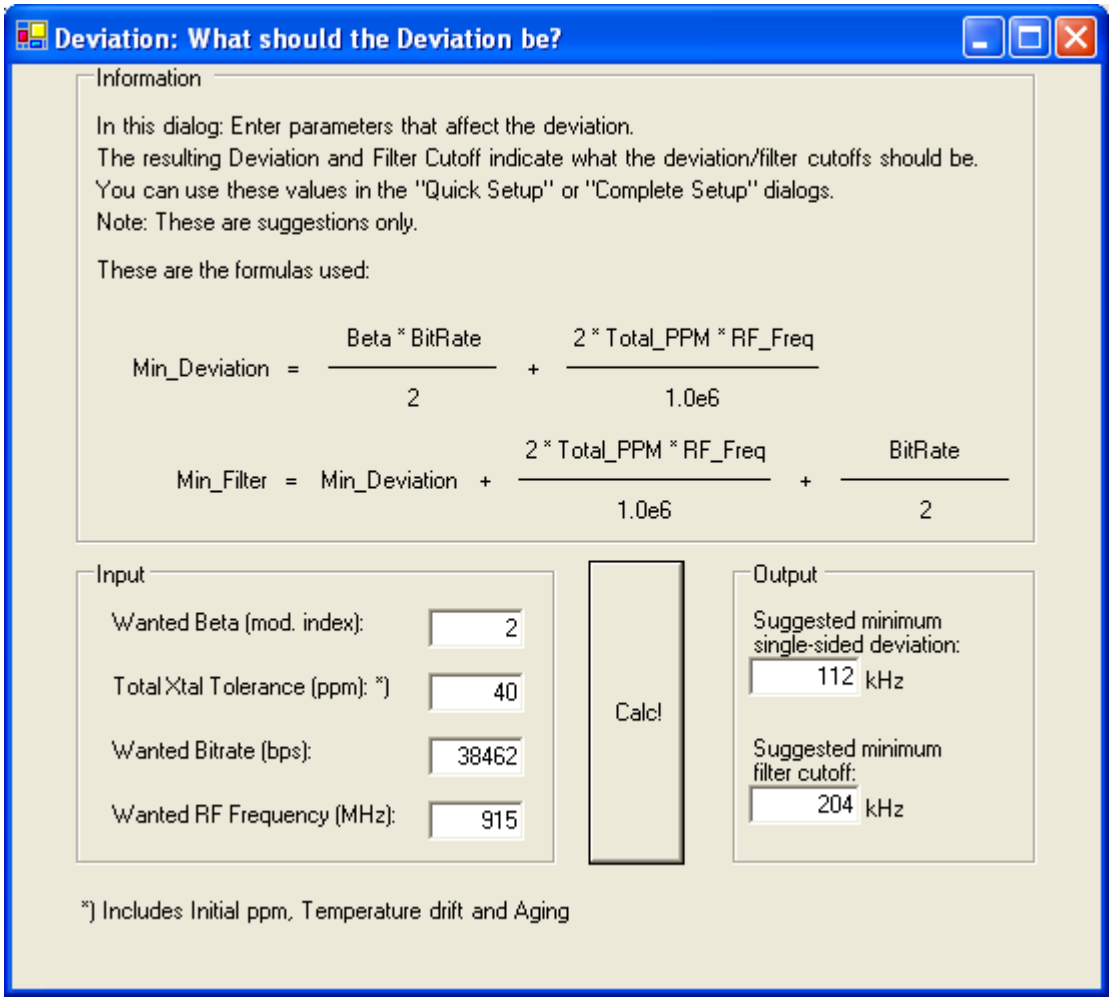
4.12. →Deviation

This is an aid for getting an idea of what the deviation and filter settings should be

4.13. →Deviation →Deviation Select Help …

Enter values and calculate.

The formulas used are shown in the window.



Note that the resulting “beta” will be higher than the input. The entered beta is considers a “minimum beta”.

5. Changes in this sw version

NOTE: The list below is simply a randomly ordered list of changes/updates from version 07.

2005 12 19 PKB

- New Installation procedure (double-click “setup.exe”)
- Completely re-organised main window
- Schematics and component suggestions
- In Loop filter calculator: Possible to input component values and calculate the resulting bandwidth and phase margin.